

Topics in Primary Care Medicine

Preventable Complications of Diabetes Mellitus

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"Topics in Primary Care Medicine" presents articles on common diagnostic or therapeutic problems encountered in primary care practice. Physicians interested in contributing to the series are encouraged to contact the series' editors.

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Despite the introduction of insulin therapy more than 50 years ago, the life expectancy of a person with type I diabetes mellitus is about 20 years less than that of a person without diabetes, mainly due to death from cardiovascular and renal disease. Persons with diabetes suffer the complications of loss of limb and sight, and women with type I diabetes are more likely to give birth to infants with congenital anomalies.

Although there is clearly an association between the degree of hyperglycemia and many of these complications, control of blood glucose levels will not be emphasized. Instead, in this article I highlight several other ways that primary care practitioners can help in preventing the complications of diabetes.

Diabetic Eye Disease

Diabetes mellitus is the leading cause of blindness in persons between the ages of 20 and 74 in the United States. A person with diabetes who has retinopathy is almost 30 times likelier to become blind than a person without diabetes. In addition, patients with diabetes are at increased risk of three other types of eye disease: maculopathy, cataracts and glaucoma. Proliferative retinopathy accounts for most of the preventable visual loss in persons with type I diabetes; cataracts, macular edema and glaucoma are mainly responsible in type II diabetes. Effective means of diagnosing and treating all four conditions exist.

Proliferative Retinopathy

Proliferative retinopathy is characterized by the development of new blood vessels in the retina and is usually asymptomatic unless vitreous hemorrhage occurs. Overall, between 3% and 5% of all persons with diabetes have proliferative retinopathy; many more, of course, have background (micro-

aneurysms) or nonproliferative (intraretinal hemorrhages and exudates) retinopathy.

The longer a patient has had diabetes, the greater the risk of proliferative retinopathy. Half of all persons with type I diabetes, and 20% with type II diabetes, have proliferative retinopathy after 20 years of diabetes. In general, persons with type I diabetes who have had their disease for five years or more, and all those with type II diabetes (many of whom have had undiagnosed diabetes for several years) are at risk for proliferative retinopathy. Hypertension is probably an additional risk factor.

Recognizing proliferative retinopathy may be a problem for primary care physicians. In a survey of 193 such physicians in the San Francisco Bay Area, it was found that although 90% examined the optic fundi of their diabetic patients annually, only one of the physicians dilated the pupils. Even through dilated pupils, senior medical residents, internists and diabetologists miss about half of the cases of proliferative retinopathy. Thus, all diabetic persons at risk should be examined by an ophthalmologist; the primary care practitioner should arrange this referral.

Because progression to proliferative retinopathy takes several years, patients without any retinopathy or with background retinopathy only on initial examination can be followed every year or two (perhaps on or about their birthdays, as a convenient reminder). Those who have moderate or severe nonproliferative retinopathy will need more frequent examinations.

Persons with proliferative retinopathy should be treated promptly with panretinal photocoagulation, which has been shown to reduce the incidence of blindness by 50%. It is not known exactly how photocoagulation works; one idea is that it decreases the ischemic stimulus for new vessel formation. The efficacy of tight glycemic control, the use of aspirin,

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ABBREVIATIONS USED IN TEXT

LDL = low-density lipoprotein

VLDL = very-low-density lipoprotein

aldose reductase inhibitors, photocoagulation of nonproliferative retinopathy and various treatments for vitreous hemorrhage is currently under study.

Maculopathy

Patients with diabetes are also at risk for visual loss due to macular edema, which manifests as thickening of the retina, often with loss of retinal transparency. Unlike proliferative retinopathy, maculopathy is more common in persons with type II diabetes, about 6% of whom have this complication.

Focal photocoagulation has reduced the incidence of further visual loss among persons with maculopathy and decreased vision in trials reported from Great Britain. These results, which were less dramatic than those seen with photocoagulation for proliferative retinopathy, are being evaluated in an ongoing US study.

Cataracts

Persons with diabetes, especially those with long-standing hyperglycemia, are about twice as likely as those without diabetes to have cataracts. More than 20% of diabetic persons have significant visual loss (corrected visual acuity worse than 20/40) associated with cataracts. Surgical treatment, with or without intraocular lens replacement, is about 90% effective at restoring vision. However, many type I diabetic patients with cataracts also have significant retinopathy. Their prognosis is slightly less favorable; in addition, post-surgical complications such as retinal detachment may be more frequent.

Glaucoma

Nearly 6 out of 100 patients with diabetes have elevated intraocular pressures. Although there is a type of secondary glaucoma that is unique to diabetes (so-called rubeotic glaucoma, due to neovascularization), the vast majority of diabetic patients with glaucoma have open-angle disease and can be treated with standard therapies. Refractory patients may require laser trabeculoplasty.

Cardiovascular Disease

Persons with diabetes are at increased risk of coronary heart disease, congestive heart failure, peripheral vascular disease and stroke. The usual risk factors—age, hypertension, smoking and hypercholesterolemia—appear to hold. Three of these risk factors are modifiable.

Treatment of hypertension and hypercholesterolemia reduces the incidence of coronary heart disease, stroke and congestive heart failure among persons without diabetes. Because the effects of risk factors are cumulative, the potential benefit of risk factor modification may be even greater in persons with diabetes, especially those with several risk factors. In addition, blood pressure control may be beneficial in preserving renal function and in preventing retinopathy.

Hypertension

About half of all persons with diabetes have high blood pressure (> 140/90 mm of mercury), only 30% to 50% of

whom are under control. Diabetic persons with hypertension should be treated with the usual stepped-care approach, beginning with weight reduction and a salt-restricted diet, then adding a diuretic or β -blocker. Serum potassium levels should be monitored: diuretic-induced hypokalemia may worsen glucose tolerance, and severe hyperkalemia can be caused by the potassium-sparing agents (triamterene, amiloride, spironolactone, captopril), especially in patients with type IV renal tubular acidosis. Patients with autonomic neuropathy should receive β -blockers and sympatholytics (methyldopa, clonidine, reserpine, guanethidine) with caution. β -Blockers reduce the adrenergic response to hypoglycemia and may thereby mask its symptoms in patients taking insulin. Impotence may be a problem with many antihypertensive agents; some have suggested that prazosin may be free of this side effect.

Hypercholesterolemia

Diagnosis and treatment of a diabetic patient with hypercholesterolemia is more problematic. Plasma cholesterol is carried in both low-density (LDL) and very-low-density (VLDL) lipoproteins. Only the LDL fraction is known to be atherogenic. Many patients with diabetes, however, have elevated VLDL levels, which causes a mild to moderate increase in total cholesterol. In addition, poor glycemic control can result in elevated cholesterol levels (both LDL and VLDL). This confuses the interpretation of total cholesterol as a risk factor for cardiovascular disease.

All diabetic patients should be advised to follow a prudent (low saturated fat) diet and to exercise regularly. Those who have a substantial elevation of total plasma cholesterol (greater than about 240 mg per dl) on this regimen should have a fasting LDL cholesterol level determined. Treatment with cholestyramine or other bile-acid binders should probably be reserved for patients with serum LDL cholesterol levels greater than about 200 mg per dl despite reasonable glycemic control.

Triglyceride levels need not be routinely measured. An elevated triglyceride level, per se, does not appear to be a cardiovascular risk factor and may just be a result of obesity, poorly controlled hyperglycemia or both.

Smoking

Smoking should be vigorously discouraged. If nicotine-containing chewing gum is prescribed, it should be in conjunction with a smoking cessation program. Although nicotine reduces peripheral blood flow, vascular disease is not a contraindication to the use of nicotine gum; smoking cigarettes has a similar effect.

Amputations

Persons with diabetes are at least 15 times more likely to suffer an amputation than those without diabetes. More than half of all nontraumatic amputations in the US occur in diabetic patients. Among persons with diabetes, about 20% of all admissions to hospital are for foot problems.

Good foot care may reduce the incidence of amputations by more than half. The proportion of physicians, however, who regularly examine the feet of diabetic patients is disappointingly low. In one diabetes clinic, only half of the patients had a foot examination in a given year! On any single visit,

only one in eight patients with diabetes had a foot examination.

The basic tenets of good foot care are outlined in Tables 1 and 2. Physician examination of the feet has the additional benefit of emphasizing the importance of foot care to a patient.

Foot Lesions

The treatment of diabetic foot infections was reviewed in a previous article in this series. Noninfected lesions can be treated conservatively with rest and elevation. Once infection has occurred, debridement and aggressive antibiotic therapy are needed, including anaerobic coverage (such as clindamycin or cefoxitin). Many patients will need hospital care, the exceptions being compliant patients without gangrene or systemic signs who respond to therapy within a few days. Radiographs or a bone scan to rule out osteomyelitis should be done. Nonhealing ulcers associated with ischemia (diminished foot pulses and Doppler pressures) may require angiography and revascularization.

Complications of Pregnancy

Women with type I diabetes have complicated pregnancies and deliveries and are more likely to give birth to infants with congenital anomalies, respiratory distress syndrome, hyperbilirubinemia and hypoglycemia. They should be managed at an obstetrical center that is experienced at treating diabetic pregnancies. Because pregnancy may accelerate the progression of retinopathy in women with type I diabetes, ophthalmologic evaluation is also prudent.

A primary care practitioner is essential in the prevention of unplanned pregnancies and in the preparation for planned ones. A diabetic woman of childbearing age should be taught

TABLE 2.—*Good Foot Care: The Patient's Role*

Examine feet daily, using a mirror if necessary. Look for hot spots, cracks, inflammation. If skin is dry, bathe feet in warm (not hot) water, dry thoroughly and rub in lanolin or milk oil
Do not smoke
Change shoes twice a day. Wear shoes with leather uppers, which mold to the feet. Be especially careful when wearing new shoes
Cut toenails straight across
Never walk barefooted
Take off your shoes and socks each time you visit the doctor

that organogenesis occurs in the first two months of pregnancy, often before she is aware that she is pregnant or seeks obstetric care. Careful control of blood glucose levels during this critical period can substantially reduce the incidence of serious congenital anomalies. Exactly how tight control should be remains an open question; many authorities recommend attempting to normalize fasting and postprandial blood sugars.

Women in whom gestational diabetes develops are at an increased risk of having infants with macrosomia. Whether or not glycemic control can prevent this problem is unknown.

Conclusions

The primary care practitioner has an essential role in preventing many of the complications of diabetes mellitus. Concern over achieving satisfactory control of blood glucose concentrations should not diminish efforts to ensure that diabetic patients receive regular ophthalmologic examinations, good foot care and have their cardiovascular risk factors controlled. Diabetic women of child-bearing age should be counseled about the importance of planned pregnancies and advised to obtain early prenatal care when pregnancy occurs.

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TABLE 1.—*Good Foot Care: The Physician's Role*

Educate the patient about the importance of foot care and smoking cessation
Examine the feet at each visit. Treat lesions aggressively. Refer problems to an experienced surgeon or podiatrist
Treat risk factors for macrovascular disease
Evaluate the extent of macrovascular disease. Ask about claudication and rest pain. Examine the pulses. Consider noninvasive (Doppler) studies